DESIGN AND DEVELOPMENT OF ROTI MAKING MACHINE

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Abstract – Flat breads are very popular especially in those parts of the world where bread constitutes a major source of dietary protein and calories. There are several forms of flat bread, and the variation is mainly in terms of ingredient, technology, and quality. Several modifications in the formulations have been made in the recent past in order to improve the quality and delicacy of these food products. With urbanization and industrialization, the demand for ready to eat and easy to carry products resembling flat bread in appearance, but having desirable qualities of bread offers one exciting possibility to this effect. In India, wheat is one of the daily staples, consumed in the form of different flat breads such as Chapati, Parotha, Phulka, Puri and Tandoori Roti. Different wheat varieties have been used for the production of flat breads. In recent years, many researchers have tried to improve ingredient level, baking properties, organoleptic characteristics, nutritional value and extension of the shelf life of flat bread. They are usually produced from a simple recipe consisting of flour, salt and water in varying proportions, however, sometimes the manufactures also use optional ingredients like yeast fat, skim milk powder and certain additives like emulsifiers, hydrocolloids, enzymes and preservatives for quality improvement and shelf life enhancementIndex

Terms – CNC Router, Wood, Marking, Analysis, Mechanical Drive

I. INTRODUCTION

In India, Pakistan, Middle East and North African countries, the extensive use of wheat (Triticum aestivum) flour for the production of flat bread has been reported in the recent literature. There are several forms of flat bread, and the variation is mainly in terms of composition, technology, and quality. The typical pictures of common Indian flat breads are shown in **Figure 1**. Although flat breads are commonly prepared from whole wheat, refined or blends with other flours are also used. Several modifications in the formulations have been made in the recent past in order to improve the quality and delicacy of these food products. In India, wheat is one of the daily staples, consumed in the form of different flat breads such as Chapati, Parotha, Phulka, Puri and Tandoori Roti.

Chapati is either leavened or unleavened flat bread consumed throughout the Indian subcontinent and other parts of Middle East. It is usually prepared from whole wheat flour and sometimes yeast and fat is also included in the formulation to improve the dough handling, mixing and textural properties. The product is prepared by mixing the flour with water and other ingredients to develop the dough, sheeted and baked for short time. They have creamish brown color generally prepared in households, forming a cheap source of protein and energy. The method of preparation for Tandoori Roti is similar to Chapati. The flour is mixed with water, shortening and salt, sour dough or yeast, sheeted and baked in a tandoor and is creamish brown to brown in colour. Parotha is typical Indian flat bread prepared from wheat flour, water, oil, salt while sugar and egg form optional ingredients. Although two types of Parotha are generally prepared in India. South Indian Parotha and North Indian Parotha differ in extraction rate of flour. The Parotha is creamish white to brown in color, and possesses the several distinct layers and consumed along with vegetarian or non-vegetarian dishes.

The flat breads are usually produced from a simple recipe consisting of flour, salt and water in varying proportions, however, sometimes the manufactures also use optional ingredients like yeast fat, skim milk powder

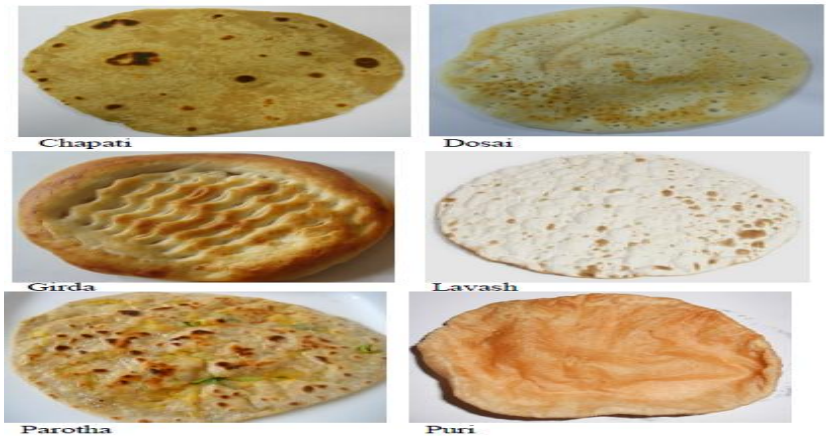

Figure 1 Common Indian flat breads

and certain additives for quality improvement and shelf life enhancement. Flour nature and water are themost important ingredients that affect the texture, aroma and chewability of flat bread .

They are prepared from the flour of various extraction rate, which should have medium gluten strength, high water absorption capacity and starch damage. Salt in various amounts is used ranging from about 0.5% to 1.5% to 2% of flour weight which enhances the flavor. The leaving agents mainly used in flat bread products are yeast, sourdough and baking soda. The fermentation process is proceeded in some flat breads by mainly yeast and sourdough. The lipid of various concentrations 0.5% - 5% has been added to the flat breads which improve their

textural and sensory properties. In addition to the numbers of emulsifiers, hydrocolloids and enzyme preparations have been added to the recipe to modify the process conditions so as to offer the consumer fresh bread at any time.

With urbanization and industrialization the consumer's demand for fresh flat breads has increased day by day, so the new technologies have been developed to cater the demand of the product which is easy to produce and economical. The development of new technologies helps to understand the influence of flour characteristics, ingredients and bread production process has been essential to improve and maintain the quality characteristics of flat breads. The influences of wheat variety, extraction rate, rheological properties ingredient level, mixing schedule, sheeting dimension, fermentation, proofing and baking schedules have been standardized from time to time and improved to enhance the sensory and textural quality of flat bread.

II. CHAPATHI MACHINE

The Chapathi machine comprises of two major sub-unit, namely the Chapathi sheeting unit and the Chapathi-baking unit. Both these units are integrated into the Chapathi continuously in largescale automatically. The forming of circular Chapathi discs of required thickness and diameter is done using the sheeting unit and the discs are transferred to the Chapathi-baking unit for baking. The development of the Chapathi machine desing includes series of improvements and is presented as improved devices. The invention is covered by Indian patents.

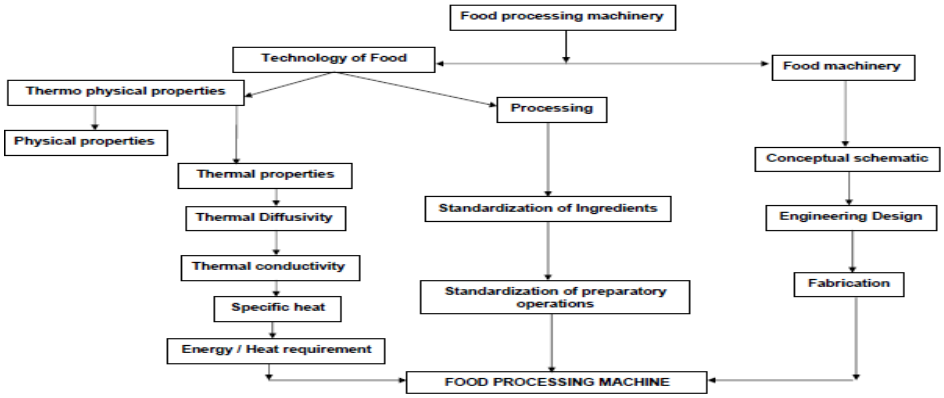

Figure 2 Schematic of Machine Development

Materials and Methods

Materials: Whole-Wheat Flour (WWF)

Commercial medium hard wheat procured from the local market was cleaned and ground in a disc mill to obtain whole-wheat flour. It contains different fraction such as maida (soft core of wheat), bran, atta and germ.

Atta(A)

Atta was obtained from international school of milling technology mill (CFTRI, Mysore). It is one of the fraction obtained from the roller flour mill and do not contain fractions such as maida, germ and bran.

Methods

Measurement of Temperature

A digital temperature indicator (Model-TFF 200, make-EBRO, Germany, PT-100, Range: -50 to 300°C) was employed to measure the temperature of the hot plate as well as the product temperature. The temperature indicator had a resolution of 0.1°C with a lest count of 0.1°C.

Determination of Thermal Conductivity

Chapathi were baked on the hot plate by discharging a known amount of dough of predetermined consistency. The probe of the temperature indicator was positioned through a hole at the center of the Chapathi disc to measure the product surface temperature. Thermal conductivity was calculated from these test results by using appropriate terms.

Sieve Analysis of the Flour

Chapathi were baked on the hot plate by discharging a known amount of dough of predetermined consistency. The probe of the temperature indicator was positioned through a hole at the center of the Chapathi disc to measure the product surface temperature. The over tailing on each sieve were weighed after 10 min of sieving and percentages were calculated on a total flour weight basis.

Design of Chapathi Machine

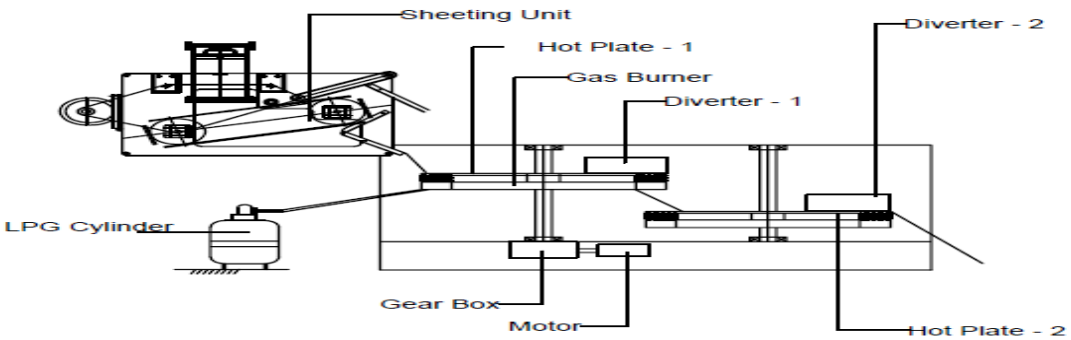

Figure 3 Chapathi Machine

The Chapathi machine as shown in Fig.3.2 comprises of two major sub-assemblies namely

1. Chapathi Sheeting Unit
2. Chapathi Baking Unit

Both these units are integrated to produce Chapathi continuously in large scale automatically. In order to protect the invention, the machines are covered by three patents.

1. Chapathi Sheeting Unit

The Chapathi sheeting unit consists of pneumatic extruder and a dusting and cutting device as the main sub-assemblies as Shown in Fig. 3.

Pneumatic Extruder

The pneumatic extruder is an important sub-assembly of the Chapathi sheeting unit. The device as shown in Fig.3.2 the exclusion is based on compressed gas. The device comprises of a conical vessel, having flanges at its top and bottom, with a provision for admitting compressed gas. A plate having a slot, fixed gas tight on to the bottom of the cylindrical vessel with suitable gasket. A pair of plates is bolted to the bottom plate for varying the thickness of the extruded sheet. The cover plates of the vessel may have additional means such as bolt and nut to make it gas tight.

The rested (15min) dough was transferred to the conical vessel of Chapathi Sheeting Unit. The dough was extruded by compressed air under air pressure (4+1 kg/cm^2) through a slit adjusted to a width of 0.8mm. The air pressure was adjusted such that the rate of extrusion was maintained constant at 800 mm per min. The circular shaped discs are cut from Chapathi dough.

The conical vessel has the drawback of cavitations, which led to the escape of the compressed air and non-uniform extrusion.

Improved Pneumatic Extruder

In order to overcome the above drawback an improved pneumatic extruder as shown in Fig.3.2 was developed. The improved device has the ability for the extrusion of dough into sheet or strands of uniform thickness at a constant rate.

III. ACKNOWLEDGMENT

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IV. CONCLUSION

By using practical data of Concept Roti Making Machine, prepared 3D CAD model for Finite Element Analysis in Solid Works 2015.

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